WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

   an integrated circuit chip having an active and a passive surface, said active surface including a protective polymer layer having been preactivated to impart adhesiveness, and at least one bonding pad;

   an electrically insulating substrate having first and second surfaces;

   a plurality of electrically conductive routing strips integral with said substrate;

   a plurality of contact pads disposed on said first surface of said substrate, at least one of said contact pads electrically connected with at least one of said routing strips;

   said second surface of said substrate being directly attached to said preactivated polymer layer; and

   bonding wires electrically connecting said at least one bonding pad to at least one of said contact pads.

2. The semiconductor device according to Claim 1 wherein said polymer layer is a polyimide layer.

3. The semiconductor device according to Claim 1 wherein said preactivation comprises

   plasma exposure of said polymer layer for increasing the surface roughness and creating molecular radicals comprising chemically unsaturated bonds.

4. The semiconductor device according to Claim 1 wherein said substrate is made of organic material and is selected from a group consisting of FR-4, FR-5 and BT resin.

5. The semiconductor device according to Claim 1 wherein a metal layer is disposed on said second surface of said substrate prior to attaching said second surface to said preactivated polymer layer on said chip.

6. The semiconductor device according to Claim 5 wherein said metal layer is selected from a group consisting of copper, copper alloy, iron-nickel alloy, invar and gold.

7. The semiconductor device according to Claim 1 wherein said at least one bonding

pad is disposed at the periphery of said chip.

8. The semiconductor device according to Claim 7 wherein said contact pads are disposed around the periphery of said substrate.
9. The semiconductor device according to Claim 1 wherein said at least one bonding pad is disposed at the centerline of said chip.
10. The semiconductor device according to Claim 9 wherein said substrate has an opening and said contact pads are disposed along said opening.
11. The semiconductor device according to Claim 1 wherein encapsulating material covers said bonding wires, said at least one bonding pad and said contact pads.
12. The semiconductor device according to Claim 1 wherein said first surface of said substrate further comprises a plurality of assembly pads, at least one of said assembly pads electrically connected with at least one of said routing strips.
13. The semiconductor device according to Claim 12 further including at least one solder ball located on at least one of said assembly pads disposed on said first surface.
14. The semiconductor device according to Claim 1 wherein said chip and said substrate have substantially the same outlines.
15. The semiconductor device according to Claim 1 wherein said integrated circuit chip comprises silicon, silicon germanium, gallium arsenide or any other semiconductor material used in electronic device production.
16. A method for attaching an integrated circuit chip to an organic substrate comprising the steps of:

providing an integrated circuit chip having an active and a passive surface, said active surface including a protective polymer layer;

activating said polymer layer by exposing it to reactive ion etching plasma, thereby increasing the surface roughness and imparting affinity to adhesion;

providing an electrically insulating substrate having first and second surfaces; and

contacting said second surface of said substrate to said activated polymer layer on said chip, whereby strong adhesion is exerted at the interface between said layer and said substrate, directly attaching said substrate to said chip.

17. The method according to Claim 16 wherein said plasma is a CF4/O2 plasma.

18. The method according to Claim 16 wherein said plasma has an energy sufficient to brake C-N bonds in the polymer layer.
19. The method according to Claim 18 wherein said plasma has an energy of approximately 70 kcal/mol.
20. The method according to Claim 16 wherein said affinity to adhesion is imparted by breaking chemical bonds of organic molecules and creating molecular radicals comprising chemically unsaturated bonds.
21. The method according to Claim 16 wherein the step of contacting said substrate to said activated polymer layer on said chip further includes the step of applying heat to said substrate and said polymer layer on said chip.
22. The method according to Claim 21 wherein the step of applying heat to the chip is further defined as applying heat at a temperature between about 150 and 350 °C.
23. The method according to Claim 16 further comprising the step of applying force between said substrate and said polymer layer.
24. The method according to Claim 23 wherein the step of applying force is further defined as applying a force to said chip of between about 5 to 7 kg.
25. The method according to Claim 23 wherein the step of applying force is further defined as applying force for a period of between about 2 and 10 s.
26. The method according to Claim 16 wherein a metal layer is disposed on said second surface of said substrate prior to attaching said second surface to said activated polymer layer on said chip.
27. The method according to Claims 16 and 26 wherein the step of contacting said metal layer disposed on said substrate to said activated polymer layer on said chip further includes the step of applying heat to said substrate and said polymer layer on said chip.
28. The method according to Claim 27 wherein the step of applying heat to the chip is further defined as applying heat at a temperature between about 150 and 350 °C.
29. The method according to Claims 16 and 26 further comprising the step of applying force between said substrate and said polymer layer.
30. The method according to Claim 29 wherein the step of applying force is further

defined as applying a force to said chip of between about 1.5 to 7.0 kg.

31. The method according to Claim 29 wherein the step of applying force is further defined as applying force for a period of between 2 and 10s.

32. A method for attaching an integrated circuit wafer to an organic substrate comprising the steps of:

providing a semiconductor wafer having an active and a passive surface, said active surface including a plurality of integrated circuits, each having bonding pads and a protective polymer layer;

activating said polymer layer of each circuit by exposing said wafer to reactive ion etching plasma, thereby increasing the surface roughness and imparting affinity to adhesion;

providing an electrically insulating substrate having first and second surfaces, including a plurality of contact pads disposed on said first surface;

contacting said second surface of said substrate to said activated polymer layer on said wafer, whereby strong adhesion is exerted at the interface between said layer and said substrate, directly attaching said substrate to said wafer;

wire bonding said circuit bonding pads to said substrate contact pads, respectively; protecting said bonding wires by encapsulation material; and separating the resulting composite structure into discreet devices.